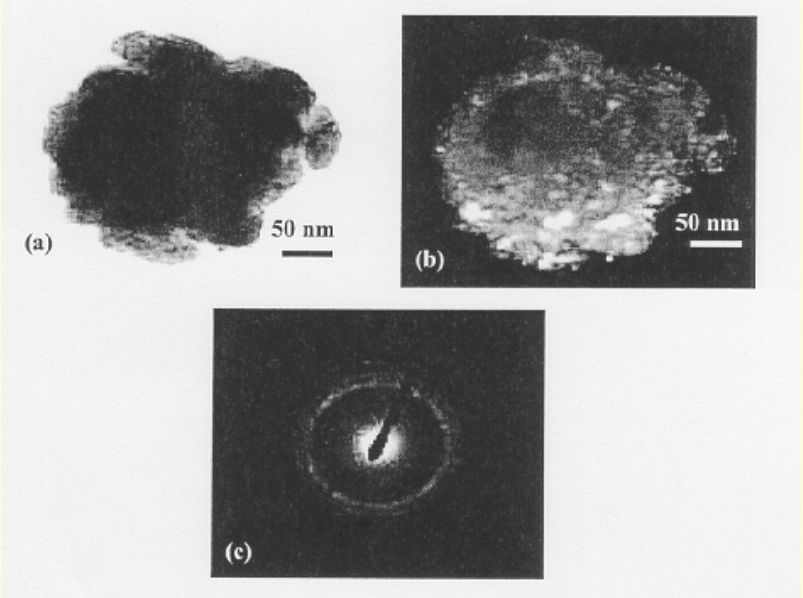
Development of Low Density Titanium Alloys

F.H. (Sam) Froes, University of Idaho, DMR-9901642

Titanium alloys offer very attractive combinations of high strength, toughness, creep resistance and environmental resistance. Though, much efforts have been devoted worldwide, toward increasing the strength of titanium alloys, a density reduction is more effective in reducing the structural weight of titanium alloys than increasing the strength or modulus. Among the various binary and ternary alloys that have been developed via mechanical alloying and physical vapor deposition , the Ti-9Mg, Ti-8Sc and Ti-9Mg-8Sc systems looked most attractive. The next step is to optimize the composition balancing density reduction with mechanical properties.



Transmission Electron Micrographs of MA'd Powder Mixture a) Bright Field Image, b) Dark Field Image and c) SADP

Development of Low Density Titanium Alloys

F.H. (Sam) Froes, University of Idaho, DMR-9901642

Education:

Five undergraduates (Matt Snider, Carl Powell, Randy Fielding, Cameroon Draney and Craig Marshal), three graduate students (Mutlu Cavusoglu, Pankaj Trivedi and Moshin Qureshi) and three post doctoral fellows (Oleg Senkov, S.N. Patankar and Fusheng Sun) contributed to this program. Randy Fielding is currently with the INEEL in Idaho Falls, Cameroon Draney joined the graduate program in Materials Engineering at the University of Idaho. Pankaj Trivedi received his MS degree and is working on his Ph.D at the Washing State University.

Anticipated Benefits and Impacts:

The study recently concluded at the University of Idaho has successfully demonstrated, on a grain scale, the capability of non-equilibrium processing techniques – mechanical alloying and physical vapor deposition – to extend solubility in titanium for a number of elements like aluminum, magnesium, scandium etc. Some of the low-density titanium produced includes Ti-Mg, Ti-Sc and Ti-Mg-Sc. The next step is to optimize the composition balancing density reduction with mechanical properties.